Rationale for Proposed Revision to Ventilation Rate Procedure (Addendum 62n)
9 September, 2000

This document is an initial draft of a rationale for the proposed revisions to the ventilation rate procedure contained in addendum 62n.

"Problems" with Ventilation Rate Procedure in Standard 62-1999

Much of the material is in nonmandatory language.

The requirements accounting for ventilation effectiveness and system efficiency are unclear and therefore often not used, leading to lower ventilation rates than intended.

The requirements accounting for intermittent occupancy and intermittent ventilation are unclear, misused and the subject of several interpretations.

The requirement for ventilation at part load (VAV systems for instance) is not explicit

Some users feel that the standard results in high ventilation rates in densely occupied spaces.

The rates need adjustment based on removal of "moderate amount of smoking,"

Exhaust ventilation requirements are not clear.

An explanation of the ventilation rates in the proposed ventilation rate procedure

The committee first developed the form of the rate calculation equations. The decision was made to include both an occupant component and a floor area component and that the two should be added together. While there are other ways to combine the two components, addition was chosen primarily as a way to deal with the "problems" of underventilation in sparsely occupied spaces and overventilation in densely occupied spaces. In addition, there is research to support the concept of additivity of ventilation rates to address sensory pollutant loads.

Given the form of the equation, the actual rates were developed by first looking at offices, about which the most relevant IAQ research has been done to date. Engineering experience and many field studies indicate that an outdoor air supply of 10 L/s (20 cfm) per person is very likely to provide acceptable perceived indoor air quality in office spaces. This was agreed upon as a reasonable combined occupant and building rate, after accounting for ventilation system efficiency. It was also agreed that the occupant component should be based on 2.5 L/s (5 cfm) per person. Laboratory and field studies have shown that with sedentary persons, this rate of clean outdoor air will dilute occupant-generated odors and irritants to levels that will satisfy a substantial majority (about 80%) of adapted persons (occupants) in the space (Berg-Munch et al, 1986; Cain et al, 1983; Fanger and Berg-Munch, 1983; Iwashita et al, 1989; Yaglou et al, 1936). In determining the people component, it was decided that a code-intended standard should not be designed to satisfy the first impressions of visitors, but rather should satisfy the building's occupants. For offices, an additional 0.5 L/s (1 cfm) per person was added to account for contaminants generated by occupant activities, such as operating copy machines and printers, for a total occupant component of 3 L/s (6 cfm) per person. In order that the result of the addition at typical office occupancy densities (6 to 9 people per 100 m^2 (1000 ft^2)) and typical ventilation system efficiencies (e.g. 60% to 90%), match the "target" of 10 L/s (20 cfm) per person of outdoor air to the system, the building component of the ventilation rate must be about 0.3 $L/s/m^2$ (0.06 cfm/ft^2). This building rate is consistent with European field studies (ECA, 1992; Bluyssen, 1995) for well designed and maintained non-smoking buildings, and for more recent studies as well. Thus the form of the ventilation rate equation and the occupant rate, building rate, overall outdoor air rate, and ventilation system efficiency are self-consistent for offices.

For other occupancy types, the occupant component was based on the floor of 2.5 L/s (5 cfm) per person adjusted for the physical activity of the occupants (activity increases the rate of bioeffluent emissions) and for typical occupant activities that generate contaminants. For the building component field data are scarce but becoming less scarce; the rates were based on the committee's judgment of how the typical contaminant sources found in the space (other than occupants and their activities) compared to those in offices. For instance, the building rate for retail stores is higher due to the emissions from merchandise that is constantly refreshed as merchandise is sold and replaced.

The overall impact of this change in rate calculation procedure is that rates are slightly lower in most spaces, particularly densely occupied spaces, while they are higher in some sparsely occupied spaces. Because of fundamental differences between the two procedures, a direct comparison is difficult, requiring assumptions to be made for occupancy density, occupant diversity, and air distribution system performance, all of which vary from project to project.